

MA 125 6C, CALCULUS I

September 9, 2009

Name (Print last name first): .....

Student Signature: .....

TEST I

No calculators are allowed!

PART I

**Part I consists of questions. Clearly write your answer (only) in the space provided after each question. Show all of your your work!**

**All problems in Part I are 6 points each**

Evaluate the following limits.

Question 1

$$\lim_{x \rightarrow 1} \frac{x^2 - 2x + 1}{x - 1}$$

Answer:  $\frac{1}{2}$

correct answer: 0

Question 2

$$\lim_{x \rightarrow 0} \frac{\sin(8x)}{2x}$$

Answer: 4

Question 3

$$\lim_{x \rightarrow \infty} \frac{2 - x^3 + 10x}{100 + 3x^3}$$

Answer:  $-1/3$ Question 4

$$\lim_{x \rightarrow \pi} \sqrt{9 + [\sin(x)]^2}$$

Answer: 3

Question 5

$$\lim_{x \rightarrow 0} \frac{-2}{x^2}$$

Answer:  $-\infty$  (or DNE)Question 6

$$\lim_{x \rightarrow \infty} \cos x$$

Answer: DNE

Question 7

$$\lim_{x \rightarrow \infty} \frac{\cos(x^2)}{x} =$$

Answer: 0

Question 8

$$\lim_{h \rightarrow 0} \frac{(4-h)^2 - 16}{h}$$

Answer: -8

**PART II**

Part II consists of 3 problems. You must show correct reasons to get full credit. Displaying only the final answer (even if correct) without the relevant steps will not get full credit.

**Problem 1 (18 points)**

Given the graph of the function  $y = f(x)$  below find:

1.  $\lim_{x \rightarrow -1^-} f(x) = 2$
2.  $\lim_{x \rightarrow -1^+} f(x) = -1$
3.  $\lim_{x \rightarrow 1} f(x) = \text{DNE}$
4.  $\lim_{x \rightarrow 2^-} f(x) = 1$
5.  $\lim_{x \rightarrow 2^+} f(x) = 1$
6.  $\lim_{x \rightarrow 2} f(x) = 1$
7.  $\lim_{x \rightarrow \infty} f(x) = 2$
8. State all intervals on which  $f(x)$  is continuous.  
Answer:  $(-\infty, 1) \cup (1, 2) \cup (2, +\infty)$ .

**Problem 2 (18 points)**

If the position of a particle at time  $t$  is given by  $S(t) = t^2$ , find:

1. the average velocity  $\bar{v}_{3, 3.1}$

Answer: 6.1

2. the average velocity  $\bar{v}_{3, 3.01}$

Answer: 6.01

3. Using the above, estimate the instantaneous velocity  $v(3)$ .

Answer: 6

Note:  $3.1^2 = 9.61$  and  $3.01^2 = 9.0601$ .

**Problem 3 (16 points)**

Evaluate the following limits:

1.  $\lim_{h \rightarrow 0} \frac{\sqrt{9+h} - 3}{h}$

Answer:  $1/6$

2.  $\lim_{x \rightarrow \infty} x - \sqrt{x^2 - x - 1}$

Answer:  $1/2$